STATE OF MAINE
PUBLIC UTILITIES COMMISSION
18 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0018

DOCKET FILE COPY ORIGINAL

February 23, 1997

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Re: CC Docket No. 96-45 - Federal State Joint Board on Universal Service

Dear Mr. Caton:

Enclosed is an Original and twelve copies of the Maine Public Utilities Commission reply comments in the above docket. These same comments were filed by the Maine Public Utilities Commission as an "ex parte filing" in this docket on February 14, 1997. Please treat these comments as "reply" comments in this docket. We served copies of that ex parte filing on the parties in the enclosed service list on February 14, 1997.

Sincerely,

Joel Shifman

STATE OF MAINE
PUBLIC UTILITIES COMMISSION
18 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0018

THOMAS L. WELCH
CHAIRMAN

WILLIAM M. NUGENT
HEATHER F. HUNT
COMMISSIONERS

RECEIVED
FEB 24 1997
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

February 14, 1997

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, DC 20554

Re: CC Docket No. 96-45 FEDERAL-STATE JOINT BOARD ON UNIVERSAL SERVICE

Dear Mr. Caton:

Enclosed is an Original and twelve copies of the Maine Public Utilities Commission ex parte Comments in the above docket. Please date stamp one copy and return in the enclosed self-addressed stamped envelope.

Sincerely,

Joel Shifman

cc: International Transcription Service
Brad Ramsay

BEFORE THE FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, D.C. 20554

In the Matter of	)	
	)	CC Docket No. 96-45
Federal-State Joint Board on Universal Service	)	
	)	

EX PARTE COMMENTS OF THE

MAINE PUBLIC UTILITIES COMMISSION

On November 7, 1996, the Federal-State Joint Board adopted a Recommended Decision on Universal Service, as required by Section 254 of the Telecommunications Act of 1996 (the Act). The Federal Communications Commission (FCC) has requested for comment on that Recommendation. Attached is a paper by David Gabel and Joel Shifman providing further comments about Cost Proxy Models. We will be following this with additional comments shortly.

Respectfully submitted,

Joel B. Shifman, Esquire
Maine Public Utilities Commission
242 State Street
Augusta, Maine 04333-0018

EX PARTE FILING REGARDING COST PROXY MODELS

David Gabel
Queens College

Joel Shifman
Maine Public Utilities
Commission

The purpose of this submission is to share with the State and FCC Staffs our current impressions of the Hatfield, Benchmark Cost Model Version 2/Benchmark Cost Proxy Model, and Telecom Economic Exchange Cost Model. These comments are preliminary and we intend to provide you with an updated report in two weeks. During the interim, we intend to take a closer look at the recently submitted models, as well as provide some additional cost data that is derived from public sources.

Modeling of Customer Locations

We believe that one of the largest errors introduced into the models is their assumption regarding the distribution of customers throughout the Census Block Groups (CBG's). The Hatfield Model, version 2.2.2, design presumes a uniform distribution of customers throughout each CBG. The BCM2 and BCPM models conjecture that customers are uniformly distributed along the roads located in the CBG. Both of those suppositions greatly distort the outputs. The flaw which is inherent in the population distribution assumptions is systemic and it renders invalid the outcomes for some CBGs. Those distortions are not randomly introduced; they are directly related to the regional differences in typography and population dispersement and distribution. Thus, they result in invalid cost outputs for many small companies and some Tier 1 companies. The presumption that the model errors involved will balance themselves out in the long-term for large study areas is erroneous. After examining both highway and USGS maps, we have found that the study areas of many large (Tier 1) companies' are homogenous from the perspective of population distribution. For some LECs, the, the CBGs are homogeneous in the sense that the population is often clustered in a small town. In such a situation, cost results do not "balance out." BCM2 assumes that customers are uniformly distributed through the CBG, but this would not be the typical case for some LECs. The models also <u>consistently</u> overstate average loop lengths and costs in locations in which the CBG includes <u>both</u> a cluster of houses and a sparsely settled rural area. The examination of USGS maps and highway maps which show town sizes indicates that those locales in which model results are systemically overstated bear marked similarities in town size, population distribution, and typography. Those areas in which the towns are big enough to require their own CBGs (or several CBGs) or where the rural CBGs contain minimal or no clustering of houses have much less distorted cost outputs.

We recognize that the absolute level of forwardlooking costs cannot be validly compared with embedded costs. However, comparisons between the ratios of prospective and embedded costs can provide a good metric for evaluating whether a model's forwardlooking cost results are likely to be reliable. This is particularly true when the two companies whose embedded costs are being compared have similar depreciation reserves and plant vintages. In our analysis, we have used embedded cost ratio comparisons for the purpose of determining whether the relative order of the magnitude of the prospective costs produced by the models is reasonable. We have also utilized these comparisons to identify which portion of the forwardlooking cost models is likely to need modification in order to produce reliable results.

The BCM2's assumption that the population distribution along the CBG roads is uniform results in the model generating an average loop cost amount for USWest South Dakota that is only slightly less then that resulting for NYNEX Maine and Vermont. This is surprising because the ratio of average embedded loop costs in Vermont are almost twice that of South Dakota. A comparison to Bell Atlantic West

Virginia is equally disturbing. The models predict loop costs that differ by less than 10 percent for the Bell Operating companies that operate in South Dakota and West Virginia, even though the embedded costs for Bell Atlantic West Virginia are 50 percent higher than those for USWest in South Dakota. These results are likely caused by the fact that South Dakota contains many small towns which have less than 1,000 inhabitants and are partially surrounded by sparsely but evenly settled rural areas. In contrast, the populations in Maine, Vermont, and West Virginia are generally less clustered and therefore the population is more evenly distributed.

An examination of the service territory of small independent telephone companies in several states clearly illustrates how town size and clustering can distort the BCM2 results.

In Maine, the Lincolnville Telephone Company's service area encompasses one CBG. Within that CBG, the telephone company has two wire centers serving two very small communities clustered at opposite ends of the CBG. Nevertheless, the BCM2 model assumes that customers are uniformly distributed throughout the CBG even though many consumers are clustered near the wire centers actually providing service to those customers. Therefore, the model predicts high costs and relatively long loop lengths rather than the low costs and shorter loops that actually exist. Lincolnville is one of the lowest cost companies in the state rather than one of the highest as predicted by the BCM2 model's distorted results. Because the loops are much shorter than those predicted by the model, correctly modeled forwardlooking costs should be much lower than those produced by BCM2. The following Table illustrates that because of this type of error, BCM2 can generate cost estimates that differ considerably from embedded costs. While we do not believe that embedded costs are necessarily "correct", we are concerned to see such a large difference between embedded and current costs. Based on our knowledge of how BCM2 operates, we believe the difference is due to an incorrect assumption regarding the population distribution, rather than a difference in costs due to changes in technology and input prices.

Telephone Company	1994 NECA USF Loops	BCM2 Loops	Percent Difference	neca loop cost	bcm2 loop cost	Percent Difference
Bryant Pond	544	597		$23.46	$68.95	-107.82%
Lincolnville	1,532	1,596		$20.83	$63.98	-112.21%
China	3,090	3,860	-22.25%	$32.86	$58.59	-57.83%
Cobbosseecontee	664	1,338	-70.06%	$21.35	$86.19	-139.56%
Island	508	na		$45.63		
Hampden	2,727			$19.43		
Hartland & St. Albans	3,134			$31.02		
Community Service	9,833	11,917	-19.22%	$21.01	$63.34	-110.38%
Oxford County	4,824	4,953		$21.01	$52.92	-92.40%
Pine Tree	5,767	6,892	-17.82%	$21.01	$48.43	-83.54%
Saco River	7,375	8,644	-15.88%	$21.01	$59.65	-104.37%
Somerset	10,744	13,052	-19.46%	$29.16	$64.55	-79.48%
Standish	6,640	5,659	15.99%	$36.04	$58.23	-47.97%
Union River	1,185	987	18.28%	$41.65	$97.58	-85.14%
Unity	4,247	3,199	28.34%	$28.51	$54.18	-64.19%
Warren	1,675			$23.98		
West Penobscot	2,029			$26.36		
Maine Telecommunications	49,074			$29.34		
New England Telephone	600,906	637,772		$28.25	$37.12	-27.31%

The BCM2 model predicts almost the same loop costs for two small telephone co-operatives (Hardy and Spruce Knob) in West Virginia. The greatest difference between those two co-operatives is the degree of clustering in the CBGs in which towns are located. That difference contributes to the fact that the ratio of Hardy's actual loop revenue requirement is three times that of Spruce Knob's. Hardy has relatively little clustering and fairly uniform population distribution in its service territory, while Spruce Knob's territory contains several villages with significant numbers of household. The largest settlement in Hardy's territory is the Town of Mathias, West Virginia with less than 30 households, while Spruce Knob contains two towns (Riverton and Circleville) which contain over 50 or maybe 100 households and two other towns that are larger than Mathias.

Part of the difference in embedded cost may also be due to the vintage of each cooperative's plant. Hardy has experienced some recent growth while Spruce Knob has not experienced any.

In Washington State, the BCM2 model predicts loop costs of $82 and $86. respectively, for two small companies. The first telephone company (Toledo) serves several small towns containing clusters of residents. The second company's (Western Wahkiakum) service territory is far more dispersed. Although clustering may partially explain the almost four times ratio of actual loop cost ($370 v. $1,333 annually) between Toledo and Western Wahkiakum, there may also be other factors at work here. Extreme weather conditions and remoteness are not adequately reflected in the models. Toledo is located on I-5 between Seattle and Portland, while Western Wahkiakum is accessible only by a narrow, two lane road and is hours away from any metropolitan area.

An examination of USGS maps reveals that clustering does not always result in an overstatement of costs. In some instances, relatively small clusters are located very far from the wire center, with little or no population between the wire center and the cluster. In those areas, the actual expense of using copper plant investment would be higher then the levels predicted by the model, which assumes that households are uniformly distributed along the roads in the CBG. Here, the average lengths would be longer than those predicted by the BCM2 model. Based on my observation of the BCM2 model, we believe that this situation is occurring in some very rural CBGs in West Virginia and Washington. This same situation may be occurring in the cases of the Alenco and Dell City Texas Telephone companies. In those instances, the BCM2 model produces costs for those two Texas firms which are on the same order of magnitude as may other Texas companies. However, the actual cost of providing service is three to six times greater than it is in other areas of Texas. Line count discrepancies and serviceareasize data problems may also be contributing to the large variations in Texas. In Dell City, for example, the costs predicted by the BCM2 model are so low that we believe the financial integrity of the co-op serving the two areas would be in doubt. This raises the question of whether any telephone service would continue to be provided in that locale if the BCM2 or Hatfield models were used to determine the level of high cost assistance.

An examination of telephone companies that serve small towns with less than 400 households in Illinois and Iowa graphically illustrates the problems caused by not recognizing the clustering factor in such communities. While the BCM2 model produces loop costs primarily in the $45-$65 range for most of these locations, the firms serving them get virtually nothing from the existing fund and most of them currently provide service at very low rates. Crossville, Illinois, population 800, provides a good case in point. Even though it has some of the lowest embedded loop costs in Illinois and currently receives no USF funds, its loop costs are estimated to be $65 a month using the BCM2 model. It appears from the high loop costs produced by BCM2 that the model is uniformly distributing all the loops in the Town of Crossville uniformly throughout the rural roads in the rural area surrounding Crossville. This results in much longer than actual loop lengths. In reality, many and possibly most of Crossville's customers live in the small town and have short low cost loops. Therefore, prospective costs in Crossville should be much lower rather than those forecasted by the model.

Although we have discussed only a small number of CBGs in detail here, we have examined the model results for numerous of other CBGs in many other study areas and have found similar problems. The study areas where CBGs were examined include but were not limited to:

1. Bell Atlantic - West Virginia
2. U.S. West - Washington State
3. Citizens - West Virginia
4. U.S. West - North Dakota

5. U.S. West - South Dakota
6. Nemont - North Dakota
7. Ronan - Montana
8. West Side - Pennsylvania
9. Island - Maine
10. Woodhill - Illinois
11. Hot Springs - Montana
12. Triangle - Montana
13. Armstrong - New York

The fact that the BCPM proxy model predicts much higher costs than actual forwardlooking costs in many areas illustrates another problem with the Joint Board recommendation. That recommendation allows small firms to use proxies almost immediately if they want to, instead of book costs as a basis for determining the level of their high cost support. A process that allows companies to pick the method most beneficial to them is costly, because it allows them to "game" the system. However, a system allowing businesses to choose, based on a defective cost model, is totally unacceptable. That system will allow some companies to unfairly benefit from the errors in the model and to develop a reliance on those undeserved and unneeded funds. We cannot recommend the use of the proxies for small companies until the problems with them are remedied.

Today, Monday, February 10, 1997, we received both the recent filing made regarding the BCPM model and the Hatfield model. A preliminary review indicates that the BCPM model has not been changed materially with regard to assumed customer locations. The Hatfield model has been changed materially (see page 31 to 33 of AT&T's February 7, 1997 filing). Now the Hatfield model does appear to assume clustering, differing amounts of clustering depending on the density zone and whether or not the CBG has greater or less than 50% empty area. It is not clear whether the clusters involve multi-unit dwellings or dwellings located close to each other. Although the revised Hatfield model may resolve many of the problems we have identified with BCPM2 when modeling costs in the Midwest, it will vastly understate costs in those areas where no clustering occurs within the CBG. Those areas are likely to occur in Appalachian and rural eastern states like West Virginia, Vermont, New Hampshire, Maine and upstate New York. The Hardy Telephone Company in West Virginia, and Vermont which we have examined are two examples where the revised Hatfield methodology is likely to seriously underestimate loop lengths.

We are currently working on two proposals to resolve the problem we have identified and will file additional comments describing those proposals in more detail. Briefly, we propose to use Census Block rather than CBGs or to use a random loop sample in lieu of either the BCPM or Hatfield methods for determining loop lengths. Mark Kennet has developed a program that combines data bases to provide wire-center boundaries, as well as census block data. (The Cost Proxy data should be employed in future versions of the model.) The use of this information would not only ensure that customers are attached to the appropriate wire center, but also that the size of the serving area could be modified to better reflect the engineering practices of the telephone companies. Because census blocks are smaller than census block groups, they can be combined or split to better comport with the size of the serving areas.

We are also exploring the availability of other existing data bases that may provide useful information regarding loop lengths.

DATA INPUTS
CORPORATE EXPENSES

One of the data issues that need to be resolved by the FCC is the treatment of overhead costs as an input to any model. Both the Commission and the Joint Board have expressed their preferences for basing cost estimates on the costs incurred by an efficient telecommunications supplier. Almost all studies of the overhead costs of Telephone Companies begin with a review of historical data. In this section of the paper, we use data from the Rural Utility Services of the Department of Agriculture to identify the level of corporate operations expenses.

According to the Rural Utilities Service, Corporate Operations Expense covers the following accounts: general office salaries and expenses, accounting, treasury, legal services, and other general office expenses.[1]

We have used data from 1993 to see how corporate expenses vary by such factors as the number of subscribers served, service territory, and gross investment. We make no claims regarding the extent to which the results reported below reflect efficient or inefficient operations. Rather, the estimates provide a good starting point regarding the type of cost levels experienced by over 800 Independent companies in the United States. Neither have we attempted to allocate the corporate operations expenses between universal and non-universal service related products.

We have used access lines to divide the RUS companies into four groups: less than 1,000, 1,000 to 5,000, 5,000 to 10,000 and 10,000 to 50,000. We have used these four classifications in order to keep the number of Tables at a reasonable level, and because other classifications did not provide useful results. For example, we found that if we further stratified the smallest group, the cost estimates did not make much sense.

All of the Tables show the results from our effort to estimate the variation in corporate expenses between RUS companies. We have used four explanatory variables in our regression. First, the RUS data indicates the number of subscribers. Since a customer may have more than one access line, and because

---

[1]RUS Bulletin 1744-2 states that accounts 6710, 6720, and 6790 constitute the corporate operations accounts. See p. 15.

company lines may not be classified as a subscriber line, subscribers are not synonymous with access lines. While we do not know the magnitude of the difference for 1993, data from 1986 suggest a difference in the order of 2.7%.[2] Unfortunately, the RUS data does not indicate either the minutes of use for toll or exchange traffic, nor subscription levels for enhanced services. Therefore we have to use the number of subscribers as our measure of output.

We control for the size of the service territory through the use of two variables, cable route miles and the square miles of service territory. The route miles include both loop and interoffice facilities. The figure includes route miles for both traditional cable facilities as well as microwave paths. The square miles variable identifies the area served by the RUS company. According to the government agency, "This includes the system's entire certificated or authorized service area whether or not subscribers are served in all parts of the area."[3]

Finally, often in telephone cost studies, costs that can not be directly assigned are loaded on to directly assigned investments or costs. For example, the cost of supervisory personnel is often loaded onto the wages that are directly assigned to certain activities. In the same spirit, we also report our results from

---

[2]United States Department of Agriculture, Rural Electrification Administration, 1986 Statistical Report: Rural Telephone Borrowers, REA Bulletin Number 300-4, p. xvi.

[3]United States Department of Agriculture, Rural Electrification Administration, 1986 Statistical Report: Rural Telephone Borrowers, REA Bulletin Number 300-4, p. iv.

explaining the variation in corporate expenses by looking at the correlation between embedded investment and corporate expenses. We find that this variable does the best job at explaining the variation in corporate expenses. At the end of this section we turn to how this data could be used by the Commission to estimate the cost of service.

Since the RUS data is for the year ending December 31, 1993, our regression estimates reflect the relationship between corporate expense and the four explanatory variables. For the variable subscribers, we also provide the cost estimate on a monthly basis.

The first Table of results indicates that depending on the variables included in the regression analysis, our point estimate for the monthly corporate expense for the smallest of companies ranges from $9.24 to $16.21 per subscriber per month. The F value for each of the runs is statistically significant at any standard level of confidence. Interestingly though, the best fit of the data is obtained when we model corporate expenses as a function of investment.

Corporate Operations Expense: Companies With Less than 1,000 Subscribers				
Subscribers	110.82/9.24(2.794)	117.69/9.81(2.901)	198.48/16.21(4.374)	
Cable route miles	398.9332(6.904)	444.51(57.24)		
Square miles of service territory	11.751(3.097)			
Telephone plant in service				.0476805(13.953)
Y-Intercept	36,355.4(1.389)	30,481.24(1.140)	66,664.16(2.188)	78,631.35(7.051)
Adj R-squared	0.3547	0.3229	0.0934	0.5253
F	33.25	42.96	19.13	194.68
177 Observations; T-Statistics in Parenthesis				

Our second set of results apply to companies with between 1,000 and 5,000 subscribers. For this group, the monthly cost estimate ranges from $8.65 to $11.85. This narrower range suggests that economies of scale are present in the range of company sizes considered in these first tables. As with the first Table, gross investment does the best job at explaining the variation in the level of corporate expenses. The value of the intercept term is also of interest. The values are suggestive of the level of fixed costs, that is, costs that persist as output asymptotically approaches zero.

Corporate Operations Expenses: Companies With Between 1,000 and 5,000 subscribers				
Subscribers	103.79/8.65(8.218)	103.89/8.66(8.085)	142.19/11.85(11.566)	
cable route miles	132.4828(6.493)	145.6384(7.104)		
square miles of service territory	5.98632(4.091)			
telephone plant in service				.0399095(18.998)
Y-intercept	85290.2(2.757)	85698.39(2.723)	83373.15(2.514)	148559.4(7.870)
Adj R-squared	0.3286	0.3050	0.2282	0.4460
F	74.25	99.51	133.77	360.91
450 Observations; T-Statistics in Parenthesis				

The regression results for firms' with between 5,000 and 10,000 subscribers also are supportive of the hypothesis of economies of scale. Again the band of per subscriber cost estimates is narrower than in the first Table.

Corporate Operations Expense: Companies With Between 5,000 and 10,000 Subscribers				
Subscribers	62.25/5.19(2.787)	63.57/5.30(2.770)	70.201/5.85(3.094)	
Cable route miles	7.221(0.223)	47.996(1.591)		
Square miles of service territory	18.252(2.983)			
Telephone plant in service				.0263776(6.726)
Y-intercept	384627.6(2.482)	358068.3(2.252)	370028.9(2.318)	402846.2(5.511)
Adj R-squared	0.1161	0.0666	0.0565	0.2363
F	7.26	6.10	9.57	45.24
144 Observations; T-Statistics in Parenthesis				

For the final classification, companies with between 10,000 and 50,000 subscribers are regression results are less satisfactory. The parameter estimates for cable route miles and square miles of service territory are not statistically significant, and oddly, for some of the regressions, have negative signs. On the other hand, the coefficient for telephone plant in service is statistically significant at standard levels of significance, and has a very high coefficient of determination (adjusted R-squared).

Corporate Operations Expenses: Companies With Between 10,000 and 50,000 subscribers

Subscribers	149.064/12.42(1.441)	138.89/11.57(1.392)	116.301/9.69(1.212)		117.592/9 .80(1.219)
cable route miles	-681.5568(-0.849)	-440.7786(-0.835)			
Square miles of service territory	164.0666(0.400)				-97.58992 (-0.360)
Telephone plant in service				.0393242(102.332)	
Y-intercept	1309085(0.561)	1217585(0.526)	482861.7(0.226)	-36960.98(-0.399)	667164.9 (0.303)
Adj R-squared	-0.0073	0.0017	0.0049	0.9909	-0.0043
F	0.77	1.08	1.47	10471.92	0.79

97 Observations; T-Statistics in Parenthesis

Based on the regression results reported above, we recommend that corporate expenses be added as a loader. The parameter estimates provided above can be used to estimate the corporate expenses. Either using the results reported in each table could do this, or in order to reduce the number of calculations that must be conducted within the model, data from the following Table could be used:

Corporate Operations Expenses: Companies with Less than 50,000 Subscribers	
Telephone plant in service	.03914(244.47)
Y-intercept	128,018(9.84)
Adj R-squared	0.9857
F	59,766
865 Observations; T-Statistics in Parenthesis	

For example, if a company has 700 subscribers, the regressions results suggest a point estimate of 128,018 + .03914 * telephone plant in service = predicted corporate expenses. The corporate predicted expenses than has to be allocated between USF and non-USF related activities. We elect to make no recommendation regarding the appropriate allocation.

Digital Line Carrier Systems

BCPM separates the cost of digital line carrier "between the fixed costs of the remote terminal and the digital loop carrier costs that vary by line. The fixed remote terminal costs include the optical line interface units, software, cabinet, power, and the access resource manager common card kit, as well as the comparable components at the central office terminal. The per line components include the line cards at the remote terminal and the central office terminal."[4]

Local exchange carriers often use a combination of two types of digital line carrier systems: integrated and universal digital line systems. The following table illustrates that a primary difference between integrated and universal digital line carrier systems is the provision of ISDN.

Services Available	Universal DLC	Integrated DLC
Single-party POTS	Yes	Yes
2-wire locally switched special service	Yes	Yes
Coin	Yes	Yes
Multiparty	Yes	Yes
Frequency selective ringing	Yes	Yes
Direct inward dial (DID)	Yes	Yes
Integrated services digital network (ISDN)	Yes	No
Fiber-to-The Home POTS	Yes	Yes

Since universal digital line carrier systems provide additional functionality, the equipment is more expensive than the integrated system.

The BCPM model uses integrated digital loop carrier technology: According to the model developers, "This technology eliminates many of the costs associated

---

[4]BCPM submission to the FCC, January 30, 1997, Attachment 9, p.131.

with standard or 'universal' systems."[5] The selection of the integrated system is consistent with the Joint Board's November 1996 finding that the USF should cover the cost of providing POTS.

Crossover Point Between Copper and Fiber

The BCPM submission claims that at 9,000 feet in the feeder plant, there should be a break point between copper and fiber. The model sponsors argue that this technology crossover point is required "to provide a network that will economically be pre-provisioned for DS1 and below (ISDN, POTS, etc.). The model sponsors claim that if this break point is exceeded, costs would increase "dramatically due to courser gauge copper cables, special repeaters, increased switch costs and the like."[6]

The developers of BCPM have not provided any data to support this conclusion. For more than a twenty years, this type of engineering analysis has been routine and unfortunately has not been included in the model. Our own experience suggests that the economic crossover point is very much a function of the relative cost of different technologies and customer density. While it may be the case that the economic crossover point between copper and fiber is 9,000 feet, we have seen few studies to support such a conclusion for voice services. Rather, this crossover point may be appropriate where there is substantial demand

---

[5]BCPM submission to the FCC, January 30, 1997, Attachment 9, p.135.

[6]BCPM submission to the FCC, January 30, 1997, answer to question 9, p.10.